

## ABSTRACT

A method to implement direct digital QAM modulation at an RF frequency results in the superior characteristics of high output power using non-linear amplifiers, high frequency resolution, low phase noise, instantaneous  
5 frequency change capability, wide frequency setting ability, and suitability for full implementation in a digital ASIC. Two digitally synthesized RF signals are generated for use as the two vectors. The two vectors are individually controlled in phase and summed to provide a combined phase and amplitude modulation that forms the modulated signal. The synthesized RF signal is generated from a higher  
10 reference frequency using a variable pulse stretching technique implemented with programmable delay lines. The amount of the pulse stretch in each cycle is controlled by a phase increment value. Pulse stretching can be extended beyond one cycle by pulse swallowing, allowing the generation of an RF signal from DC up to and including the input reference frequency. Phase modulation is added by digital  
15 control of the pulse stretching according to the phase modulation data bits.